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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UTILITY PATENT APPLICATION TRANSMITTAL LETTER

Attorney Docket No.: GE04592

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To: Assistant Commissioner for Patents  
Box Patent Application  
Washington D.C., 20231

Dear Sir:

Transmitted herewith for filing under 37 C.F.R. 1.53(b) is a Nonprovisional Utility Patent Application:

- ☒ New Application; or
- ☐ Continuation; or ☐ Divisional; or ☐ Continuation-In-Part (CIP);  
of prior US Application No. \_\_\_\_\_, filed on \_\_\_\_\_, having  
U.S. Examiner \_\_\_\_\_, in Group Art Unit \_\_\_\_\_

Of: Steven R. Tugenberg, Douglas A. Hardy, and Thomas E. Tkacik

For: **SECURE MEMORY AND PROCESSING SYSTEM HAVING LASER-SCRIBED  
ENCRYPTION KEY**

- ☒ 2 sheets of drawings and 24 pages of specification and claims.
- ☒ Newly executed oath or declaration combined with Power of Attorney on 2 pages.
- ☐ Copy of oath or declaration from prior U.S. application serial no. \_\_\_\_\_  
☐ The following named inventor(s) from the prior application are hereby deleted from this  
application in accordance with 37 C.F.R. 1.63(d)(2) and 1.33(b);  
\_\_\_\_\_
- ☐ Foreign priority to \_\_\_\_\_ patent application having serial number \_\_\_\_\_  
and a filing date of \_\_\_\_\_, is hereby claimed under 35 USC 119.  
☐ A copy of the priority document is included herewith.
- ☒ An Assignment Transmittal Letter and Assignment of the invention to Motorola, Inc.
- ☐ An Information Disclosure Statement (IDS), with PTO-1449, and \_\_\_\_\_ citation copies.
- ☒ Return Receipt Postcard.
- ☐ Preliminary Amendment.
- ☐ Please cancel pending claims \_\_\_\_\_.
- ☐ Incorporation by Reference (for Continuation/Division/CIP application). The entire disclosure  
of the prior application, from which a copy of the oath or declaration is supplied, is considered  
as being part of the disclosure of the accompanying application and is hereby incorporated by  
reference therein. Since the present application is based on a prior US application, please  
amend the specification by adding the following sentence before the first sentence of the  
specification:

"The present application is based on prior US application No. \_\_\_\_\_, filed on  
\_\_\_\_\_, which is hereby incorporated by reference, and priority thereto for  
common subject matter is hereby claimed."

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10913 U.S. PTO

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- ☐ Applicant hereby petitions pursuant to 37 C.F.R. § 1.136(a) for a \_\_\_\_\_ month extension of time for response to the outstanding Official Action mailed \_\_\_\_\_. The period for response was previously set to elapse \_\_\_\_\_, and is accordingly hereby extended to \_\_\_\_\_, which is still within the six-month statutory period for response (35 U.S.C. § 133) which elapses \_\_\_\_\_. The reason for this petition is that a Division, Continuation, or CIP is being filed, and it is desired to maintain the present application in pending condition pursuant to 35 USC § 120 through at least the filing of the Division, Continuation, or CIP application. The required Extension Fee established by 37 C.F.R. § 1.17(a) pursuant to 35 U.S.C. § 41(a) (8) is:

EXTENSION	FEE
<input type="checkbox"/> First Month	\$110.00
<input type="checkbox"/> Second Month	\$380.00
<input type="checkbox"/> Third Month	\$870.00
<input type="checkbox"/> Fourth Month	\$1,360.00
<input type="checkbox"/> Fifth Month	\$1,850.00

- ☒ The filing fee is calculated as follows:

## CLAIMS AS FILED, LESS ANY CANCELED BY AMENDMENT

FOR	NUMBER OF CLAIMS	NUMBER EXTRA	RATE	FEE
TOTAL CLAIMS	21 - 20 =	1	x \$18	= \$18.00
INDEPENDENT CLAIMS	3 - 3 =	0	x \$78	= \$ 0.00
MULTIPLE DEPENDENT CLAIMS			\$260	= \$ 0.00
BASIC FEE				= \$ 690.00
TOTAL FILING FEE				= \$ 708.00

- ☒ Please charge Deposit Account No. 13-4771 in the amount of \$ 708.00 for the Total Filing Fee, and the Extension Fee under 37 C.F.R. § 1.136(a), if applicable.
- ☒ The Commissioner is hereby authorized to charge any additional fees which may be required now or in the future during the entire pendency of this application under 37 C.F.R. 1.16 or 37 C.F.R. 1.17, including any present or future time extension fees which may be required, or credit any overpayment to Deposit Account No. 13-4771.
- ☒ This sheet is submitted in duplicate.

This transmittal letter has 2 total pages.

DATE

Sept 27, 00

Motorola, Inc.  
Customer Number 22863

Gregory J. Gorrie

Attorney of Record  
Telephone No.: (480) 441-4207  
Facsimile No.: (480) 441-5220

36,530  
REG. NO.

SECURE MEMORY AND PROCESSING SYSTEM HAVING LASER-  
SCRIBED ENCRYPTION KEY

Field of the Invention

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This invention relates in general to the field of secure processing systems and in particular to processing systems with secure memory. The present invention also relates to wireless communication devices.

10

Background of the Invention

Security is becoming a critical feature in processor and communication system designs today. It is becoming more important to be able to store non-volatile sensitive information within a product and protect this information from disclosure and/or modification. It is preferable to store this sensitive information where no external access to this data is possible. Unfortunately, it is difficult to combine technologies to accomplish this. For example, flash memory, EEPROM and fast logic devices are not easily manufactured on the same die due to incompatible process requirements or high cost.

Many portable communication devices provide connectivity to networks such as the internet. This connectivity may permit a user to purchase items over the internet using their portable communication device, but because many of these devices are relatively small and have very limited man-Machine interfaces, it is difficult to enter credit card information or other authenticating information using these portable communication devices. In addition, the Internet providers desire to make the purchasing of products on-line as simple and as pleasurable as possible.

Thus, what is needed are a system and method where credit card and authentication information is pre-loaded onto a portable communication device so that it may be easily available for on-line transactions. What

5 is also needed are a method and system that securely stores user authentication information and other sensitive information so that it cannot be easily extracted from the portable communication device, copied to another device, or modified.

- 10 What is also needed are a processing system and secure memory device that stores sensitive information in a way that it is not easily accessible. What is also needed is a method for storing and using sensitive information within processing systems and communication
- 15 devices. What is also needed is a method for communicating sensitive information over a non-secure channel such as the internet.

002700-03194-06706

Brief Description of the Drawings

FIG. 1 is a simplified block diagram of a communication device with a secure processing system in accordance with the preferred embodiments of the present invention;

FIG. 2 is a simplified procedure for loading sensitive information in accordance with the preferred embodiments of the present invention; and

FIG. 3 is a simplified procedure for using sensitive information in accordance with the preferred embodiments of the present invention.

Detailed Description of the Drawings

The present invention provides, among other things, a secure processing system for use in various types of communication devices. The secure processing system includes a host processor and a secure memory which provides for the storage of sensitive data in encrypted form in a storage medium external to the secure processing system. When needed by the host processor, the encrypted data is decrypted with encryption logic circuitry within the secure memory and transferred to a zeroizable memory for use by the host processor. The secure memory uses a laser-scribed encryption key coupled to encryption logic circuitry within the secure memory for encrypting and decrypting sensitive information. The laser-scribed encryption key is desirably unique to each device. In accordance with the present invention, the laser-scribed encryption key is generated by laser-scribing a semiconductor die during fabrication. The present invention includes other methods of generating the laser-scribed encryption key including, for example, burning on-time programmable fuses on a die.

5 The laser-scribed encryption key provides a master key used to protect sensitive data that is stored in a user's product. For example, such sensitive user data may include a user's social security number, credit card number, social security service keys or an ID used for secure digital initiatives, such as digital rights management. Sensitive data may also include application source code such as game software. Preferably only certain applications within the system will need to access this sensitive information.

FIG. 1 is a simplified block diagram of a communication device with a secure processing system in accordance with the preferred embodiments of the present invention. Communication device 10 is comprised of a secure processing system 14 having an associated external memory 12 and other communication components 13. Device 10 may, for example, be a wireless communication device, such as a cellular or wireless phone, or a wireline communication device such as a computer, or a portion thereof. Communication components 13 provide for the functionality not described in detail in FIG. 1 for either a wireless or wireline communication device, and for either communicating voice, data or video. Secure processing system 14 is comprised of a host processor 16, secure memory 20, bus 18 coupling the host processor and the secure memory and on-chip system components 15. In accordance with the preferred embodiment of the present invention, host processor 16, on-chip system components 15 and secure memory 20 are fabricated on a single integrated circuit chip and is preferably separate from external memory 12 and other communication components 13. Host processor 16 may be one or more processing elements and is preferably the main controller for secure processing system 14. Preferably, processor 16 is a digital signal processor (DSP) or a micro-controller. On-chip system components 15 comprise

other system processors, memory and other functional elements that are part of communication device 10 to allow for wireless or wireline communication of video, data and/or voice.

5       Secure memory 20 is coupled to the host processor 16 by data bus 18 and comprises a plurality of blocking gates 22 that are coupled to data bus 18. Secure memory 20 also includes laser-scribed encryption key 21 coupled to blocking gates 22. Secure memory also  
10 comprises encryption logic circuitry 23 and zeroizable memory 24. Encryption logic circuitry 23 preferably implements a symmetric encryption algorithm using laser-scribed encryption key 21. Zeroizable memory 24 is preferably a random access memory (RAM) having  
15 zeroizing input 28. Zeroizable memory 24 may be coupled to either to encryption logic circuitry 23 or data bus 18. The contents of zeroizable memory 24 are erased, for example by causing the contents to be set to a fixed value such as zero or another predetermined  
20 value when a zeroized signal is received at zeroizing input 28. System monitor 25, for example, sends the zeroizing signal to zeroizable memory 24 upon the occurrence of any one of several predetermined conditions. Such conditions may include, for example,  
25 a detection of inappropriate access to the secure information in zeroizable memory 24 or the completion of an operation where the secure data in the zeroizable RAM is no longer needed. Furthermore, the zeroized signal preferably causes the encryption algorithm  
30 embedded within an encryption logic circuitry 23 to be reset and further causes blocking gates 22 to prevent access to laser-scribed encryption key 21 by encryption logic circuitry 23 and zeroizable memory 24.

35       In accordance with the preferred embodiment of the present invention, the blocking gates 22 are comprised of logic "AND" gates which, when activated by a blocking control signal, prevent access to (e.g.,

block) laser-scribed encryption key 21. In alternative embodiment, blocking gates 22 are comprised of logic "OR" gates. In one embodiment of the present invention the blocking control signal is coupled to the zeroized  
5 signal which blocks laser-scribed encryption key 21 and zero's zeroizable memory 24 when secure processing system 14 operates in a non-secure mode.

Laser-scribed encryption key 21 is a randomly generated sequence of "ones" and "zeros" suitable for  
10 an encryption key. The sequence is laser-scribed during fabrication of a semiconductor die to create a plurality of fixed "ones" and "zeros" which make up the ones and zeros of the encryption key. It is preferred that the laser-scribed encryption key be randomly  
15 generated and unique for each secure memory 20 so that the data encrypted by any particular secure memory can only be decrypted by that particular secure memory. In one preferred embodiment, laser-scribed encryption key need not be randomly generated as long as it's value is  
20 guaranteed unique. Typically, laser-scribed encryption key is 168 bits for the triple DES encryption algorithm and 128 bits for some other encryption algorithms, although other key lengths are equally suitable depending on the amount of security desired. In  
25 alternative embodiments of the present invention, laser-scribed encryption key 21 is comprised of a one-time programmable flash memory element, or alternatively non-volatile memory such as ROM, EEPROM, MRAM (Magnetoresistive RAM), battery backed RAM or  
30 DRAM, or other fast logic elements.

Secure memory 20 includes self-test element 26 for performing self test operations within secure memory 20 and processing system 14 to help ensure proper operation thereof and help prevent fault-based attempts  
35 to access secure memory 20. Secure memory 20 may also includes debug detector 27 with debug port 29. Debug detector, among other things, functions to disable



secure memory 20 when for example software debug capability is being utilized.

Secure memory 20 includes system monitor 25 functions to help ensure the proper operation of secure memory 20. For example, improper attempts to access laser-scribed encryption key 21 or memory 24 are detected by the system monitor 25. Preferably, system monitor 25 monitors the sequence of events at power-up and when a power-up test is not completed successfully, system monitor 25 desirably prevents access to the secure memory components. In addition, system monitor 25 monitors activity on system debug port 29. Attempts to enable the debug capability of the system are detected by the system monitor 25. When system monitor 25 detects an unauthorized condition, blocking gates 22 are enabled to disable access to encryption logic circuitry 23 and zeroizable memory 24 and prevent the encryption logic circuitry 23 from accessing laser-scribed encryption key 21. In addition, system monitor 25 provides an assertion signal on zeroizing input 28 to zeroizable memory 24 to erase any information that has been stored therein.

In accordance with the preferred embodiment of the present invention, secure memory 20 is tested by self-test element 26 when secure processing system 14 is powered up. These tests, among other things, verify the proper operation of encryption logic circuitry 23, zeroizable memory 24, zeroizing input 28, and blocking gates 22. In addition, the ability of system monitor 25 to disable access to the secure memory is preferably also verified by self-test element 26 when secure processing system 14 is powered up. If any test fails, secure memory 20 is disabled.

In accordance with one embodiment of the present invention, communication device 10 contemplates having secret keys stored in non-secure external memory 12 in encrypted form, each secret key having been encrypted

with laser-scribed encryption key 21 using secure processing system 14. When needed, communication device decrypts one of the secret keys with encryption logic circuitry 23 using laser-scribed encryption key 5 21, and stores the decrypted secret key in zeroizable memory 24. The decrypted secret key may be used by host processor 16 in any number of ways, including, for communications with other communication devices.

In one embodiment of the present invention, the 10 decrypted secret key may be the user's private key which is part of a public/private key pair. In this embodiment for example, the user's private key may be used for authentication of digital signatures as well as decryption of data.

15 In another embodiment of the present invention, the secret key may be secret information used to generate a common session key with another communication device. The secret key may also be the common session key used to subsequently communicate 20 secured information. In any of these embodiments of the present invention, secure data or secure voice or video may be communicated either over wireless or wireline networks. Communication components 13 and other on-chip system components 15 are suitably 25 configured by those of ordinary skill in the art. Communication components 13, may include, for example, vocoders, transceivers, amplifiers, processors, etc.

It should be noted that, although various 30 embodiments are disclosed herein, the present invention is equally suitable for the safeguarding and use of any sensitive information. Other embodiments are described below.

In another preferred embodiment, the present 35 invention provides for a method of purchasing items over a non-secure communication link, such as the internet, for example using a secure communication device such as communication device 10 of FIG. 1.

In accordance with this embodiment of the present invention, a secure memory embedded in the Host processor is used to secure the user's sensitive information. The user of the portable communication device enter sensitive information such as a credit card numbers and other authentication information into the device. This can be done prior to any use of this information and may be performed using the device's keypad and display or it may involve downloading information from a computer, a network or wireless link.

Once the host processor is loaded with this sensitive information, the host processor uses the secure memory to encrypt the sensitive information using the laser-scribed encryption key. After encryption, the encrypted sensitive information is stored in a non-secure memory. The encrypted sensitive information does not need to be protected because this information can only be decrypted and used by the secure memory containing the laser-scribed encryption key that originally encrypted it.

The communication device may also be loaded with a digital certificate or public key used to establish a secure communication session with an internet vendor. Like the users of credit card information, the digital certificate may be encrypted by the secure memory using the laser-scribed encryption key and stored in non-secure memory.

In one embodiment of the present invention, an additional step for loading the communication device is to establish a personal identification number (PIN) for use in accessing control to the device. As with the credit card information, the PIN is loaded into the device, encrypted by the secure memory using the laser-scribed encryption key and stored in non-secure memory.

In an alternate embodiment of the present invention, an additional step for loading the

communication device is to establish biometric information for use in accessing control to the device. As with the credit card information, the user's biometric information is loaded into the device, encrypted by the secure memory using the laser-scribed encryption key and stored in non-secure memory. In accordance with this alternative embodiment, the communication device preferably comprises components for receiving the user's biometric data. Examples of these biometric reception components include retinal scan components, fingerprint reading components, voice print identification components, and speaker identification and verification components.

In order to complete a transaction the user either enter the PIN, or provided biometric data to the biometric reception circuitry. This step, for example, helps protect the communication device from misuse in the event that the device is lost or stolen. Once the PIN is entered or the biometric data is received, the encrypted PIN or biometric data is retrieved from non-secure memory and decrypted by the secure memory using the laser-scribed encryption key. The decrypted PIN or biometric data is compared to the entered PIN or received biometric data and the transaction continues where the information matches.

The communication device then sends the encrypted certificate to the secure memory where it is decrypted using the laser-scribed encryption key. The host processor uses this certificate to establish a secure session with, for example, an internet vendor. Secure Socket Layer (SSL), for example, is a standard technique used in the internet community to establish such a session.

Once the secure session is established, the host processor sends the encrypted credit card and authentication information to the secure memory where it is decrypted using the laser-scribed encryption key.

After decryption the host processor sends the decrypted sensitive information to a recipient such as an internet vendor through the secure session previously established.

- 5       One of the advantages of the present invention is that the sensitive information is never accessible outside of the host processor and the Secure Memory after it is originally loaded. In the preferred embodiment of the present invention, the secure memory  
10       and the host processor are on the same chip. In this case the sensitive information is never available outside of this chip, thus protecting the information from any external attempt to intercept it.

- 15       Another advantage of the present invention is that the user action during the purchase session is primarily only the entering of the PIN or providing the biometric information. The other steps for the secure transaction are automatic and occur without the knowledge or direction of the user.

- 20       Accordingly, user interaction is simplified during an internet purchase and the information required for on-line transactions is stored in a secure manner for multiple purchase sessions.

- 25       In accordance with other embodiments of the present invention, the present invention provides a method for transferring sensitive data over non-secure communication channels using the secure communication device of the present invention. The secure communication device includes a host processor, a  
30       secure memory that includes the laser-scribed encryption key, a non-secure memory for storing sensitive data in encrypted form; the sensitive data being previously encrypted with the laser-scribed encryption key.

- 35       FIG. 2 is a simplified procedure for loading sensitive information in accordance with the preferred embodiments of the present invention. Processing

system 14 (FIG. 1), for example, is suitable for performing procedure 200, although other processing systems may be suitable.

Sensitive data or sensitive information is loaded  
5 into the processing system or device in step 202. This information may be loaded directly through a keypad or another external interface. The keypad may be an attached keypad and be a part of communication components 13 (FIG. 1). The information may also be  
10 loaded over a communication link, for example, via the communication components 13 (FIG. 1). In one embodiment, the information is loaded in a plain text form while another embodiment, the information is loaded in encrypted form and host processor 16 (FIG.  
15 1), for example, may first decrypt the information prior to re-encrypting using secure memory 20 and storing it in external memory 12.

Once the sensitive information is loaded, the blocking gates, such as blocking gates 22 (FIG. 1) are  
20 disabled in step 204. Disabling the blocking gates permits the host processor to access the encryption logic circuitry and the zeroizable memory within the secure memory. Disabling the blocking gates also enables the encryption logic circuitry to access the  
25 laser-scribed encryption key 21 (FIG. 1). The host processor preferably never has direct access to the laser-scribed encryption key, even, for example, when the blocking gates are disabled.

In step 206, the host processor sends the  
30 sensitive information through the encryption logic. In this step, the sensitive information is encrypted with the laser-scribed encryption key by encryption logic circuitry and stored in a memory internal to the secure memory device, and preferably stored in a zeroizable  
35 RAM. The sensitive information is now encrypted with a key that is preferably only known by the secure memory

and this key can not be readily extracted from the secure memory.

In step 208, the host processor reads the encrypted sensitive information from the zeroizable memory and stores this information in a memory that is preferably external to the secure memory such as external memory 12 (FIG. 1). Physical protection of the external memory may not be necessary because the encrypted version of the sensitive information is stored in the external memory while the key to decrypt the sensitive information (i.e., the laser scribed encryption key) is kept within the secure memory.

In step 210, the host processor enables the blocking gates to disable access to the encryption logic circuitry and the zeroizable memory and prevent the encryption logic from accessing the laser scribed encryption key. In step 214, a zeroize input signal, such as zeroizing input 28 (FIG. 1) is provided to the zeroizable memory to erase any information that was temporarily stored in the zeroizable memory.

FIG. 3 is a simplified procedure for using sensitive information in accordance with the preferred embodiments of the present invention. This information, for example, may have been loaded in procedure 200 (FIG. 2). Processing system 14 (FIG. 1), for example, is suitable for performing procedure 300, although other processing systems may be suitable. Procedure 300 is executed when the host processor requires use the sensitive information that is stored in encrypted form.

In step 302, the blocking gates are disabled to allow the host processor to access the secure memory. Disabling the blocking gates permits the host processor to access the encryption logic circuitry and the zeroizable RAM within, for example, secure memory 20 (FIG. 1). It also enables the encryption logic circuitry access to the laser-scribed encryption key.

The host processor desirably never has direct access to the laser-scribed encryption key, even when the blocking gates are disabled.

Once access to the secure memory is enabled, in  
5 step 304 the host processor reads the encrypted sensitive information, for example from external memory 12 (FIG. 1) and writes this information to the encryption logic circuitry. In step 306, the encryption logic circuitry decrypts the encrypted  
10 sensitive information using the laser-scribed encryption key. In step 308, the decrypted sensitive information is stored within the secure memory, preferably in zeroizable memory 24 (FIG. 1).

In step 310, the host processor uses the sensitive  
15 information for whatever purpose the information is needed for. The sensitive information remains in the zeroizable memory until the host processor causes the information to be erased. Also, an external event, may also cause the information to be erased. Erasing the  
20 information in the zeroizable memory is accomplished, for example, by the assertion of the zeroize input (e.g. input 28 FIG. 1) of the zeroizable memory. Examples of external events which cause erasure of the zeroizable memory include the systems detection of  
25 tampering or detection of an unauthorized condition, for example by system monitor 25 (FIG. 1) or debug detector 27 (FIG. 1). The host processor may access the sensitive information as often as needed while the information remains in zeroizable memory.

30 In step 312, the sensitive information that is temporarily stored in the zeroizable memory is erased. This is accomplished by the host processor overwriting the information stored in the secure memory or by activating or asserting a zeroize input to the  
35 zeroizable memory. In accordance with this embodiment of the present invention, there is no need to re-encrypt the sensitive information or store this



information back into external memory because preferably, the original encrypted sensitive information is not removed from external memory and is still contained within the external memory to be used  
5 next time the host processor requires access to the sensitive information.

When the host processor no longer desires access to the sensitive information in the zeroizable memory, in step 314 the host processor enables the blocking  
10 gates to disable access to the encryption logic circuitry and the zeroizable memory, and prevents the encryption logic circuitry from accessing the laser scribed encryption key.

Thus, a secure memory and secure processing system  
15 for use in various types of communication devices has been described which overcomes specific problems and accomplishes certain advantages relative to prior art methods and mechanisms. The improvements over known technology are significant.

20 The foregoing description of the specific embodiments will so fully reveal the general nature of the invention that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without  
25 departing from the generic concept, and therefore such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments.

It is to be understood that the phraseology or  
30 terminology employed herein is for the purpose of description and not of limitation. Accordingly, the invention is intended to embrace all such alternatives, modifications, equivalents and variations as fall within the spirit and broad scope of the appended  
35 claims.

## CLAIMS

What is claimed is:

1. A secure processing system for a communication  
5 device comprising:  
    a host processor; and  
    a secure memory coupled to the host processor by a  
data bus, wherein the secure memory comprises:  
    a laser-scribed encryption key;  
10 encryption logic circuitry for implementing a  
symmetric encryption algorithm using the laser-scribed  
encryption key;  
    a plurality of blocking gates coupling the  
encryption logic circuitry with the laser-scribed  
15 encryption key; and  
    a memory,  
    wherein sensitive data is encrypted by the  
encryption logic circuitry using the laser-scribed  
encryption key and stored as encrypted data in a data  
20 storage medium, and  
    wherein the encrypted data is decrypted by the  
encryption logic circuitry with the laser-scribed  
encryption key and transferred to the memory for use by  
the host processor.
- 25
2. The processing system as claimed in claim 1  
wherein the memory is a zeroizable memory having a  
zeroizing input that causes the contents of the memory  
to be erased when a zeroize signal is received on the  
30 zeroizing input, and  
    wherein said zeroize signal is sent to the  
zeroizable memory by a system monitor upon the  
occurrence of one of a plurality of predetermined  
conditions.
- 35

3. The processing system as claimed in claim 1 wherein the host processor and secure memory are fabricated on an integrated circuit chip, and the encrypted data is stored in a non-volatile memory.

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4. The processing system as claimed in claim 3 wherein the non-volatile memory includes a portion internal to the integrated circuit chip and a portion external to the integrated circuit chip, and wherein the encrypted data is stored on the portion internal to the integrated circuit chip when the portion internal is available.

5. The processing system as claimed in claim 1 wherein the blocking gates are comprised of logic gates and have a blocking control signal input preventing access to the laser-scribed encryption key by the encryption logic circuitry.

6. The processing system as claimed in claim 1 wherein the laser-scribed encryption key is stored in a one-time programmable memory element.

7. The processing system as claimed in claim 1 wherein the laser-scribed encryption key is stored in non-volatile memory selected from one of the group consisting of ROM, EEPROM, MRAM (Magnetoresistive RAM), battery backed RAM or DRAM and fast logic.

30

8. The processing system as claimed in claim 1 wherein the laser-scribed encryption key is generated by laser-scribing a semiconductor die during fabrication of the secure memory to create a plurality of fixed "ones" and "zeroes" which make up the laser-scribed encryption key, and

5  
10 wherein the laser-scribed encryption key has a value that is randomly generated and is unique for each secure memory of a plurality of secure memories of different processing systems.

9. The processing system as claimed in claim 1 wherein the laser-scribed encryption key is generated by burning one-time programmable fuses on a semiconductor die to create a plurality of fixed "ones" and "zeroes" which make up the laser-scribed encryption key, and

15  
20 wherein the laser-scribed encryption key has a value that is randomly generated and is unique for each secure memory of a plurality of secure memories of different processing systems.

10. The processing system as claimed in claim 1 wherein the symmetric encryption algorithm is a block cipher encryption algorithm.

11. The processing system as claimed in claim 1 wherein the host processor is coupled to an external memory having a secret key stored therein in encrypted form, the secret key being encrypted with the laser-scribed encryption key, and said secret key being used for secure communication between the communication device and other communication devices.

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12. A secure communication device comprising:  
a host processor;

a secure memory coupled to the host processor by a  
data bus, the secure memory including a laser-scribed  
5 encryption key; and

a non-secure memory coupled to host processor for  
storing encrypted data,

wherein sensitive data is encrypted within the  
secure memory using the laser-scribed encryption key  
10 and stored as encrypted data in the non-secure memory,  
and

wherein the encrypted data is decrypted within the  
secure memory using the laser-scribed encryption key  
and stored within the secure memory for use by the host  
15 processor.

13. The communication device as claimed in claim  
12 wherein the non-secure memory has a secret key  
stored therein in encrypted form, the secret key being  
20 encrypted with the laser-scribed encryption key, and  
said secret key being used for secure communication  
between the communication device and other  
communication devices.

14. The communication device as claimed in claim  
12 wherein the communication device is a data  
communication device, and wherein the secret key is a  
private key unique to a user of the communication  
device and is part of a public-private key pair, the  
30 private key being used for decrypting data sent to said  
user, and wherein prior to using said secret key, said  
secret key being decrypted by encryption logic of the  
secure memory using the laser-scribed encryption key  
and stored in unencrypted form in a zeroizable memory.

35

15. The communication device as claimed in claim 14 wherein the data communication device is adapted for transmitting data to another communication device, and wherein the secret key is further used to generate a digital signature associated with said data, said digital signature being transmitted along with said data.

16. The communication device as claimed in claim 12 wherein the communication device is a wireless communication device for communicating secured voice, and wherein the secret key is used for generating a common session key for communicating with another communication device,

and wherein prior to using said secret key, said secret key being decrypted by encryption logic of the secure memory using the laser-scribed encryption key and stored in unencrypted form in zeroizable memory.

17. The communication device as claimed in claim 12 wherein the secret key is one of a plurality of secret encryption keys stored in encrypted form in the non-secure memory, the plurality of secret keys being encrypted with the laser-scribed encryption key, and

wherein one of the secret keys of the plurality is selected for secure communication between the communication device and other communication device, and wherein a zeroizable memory is cleared after communication with the other communication device, and

wherein prior to using said selected secret key, said selected secret key is decrypted by the encryption logic using the laser-scribed encryption key and stored in unencrypted form in the zeroizable memory.

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18. The communication device as claimed in claim 12 wherein the secure memory further comprises:

a plurality of blocking gates coupled to the laser-scribed encryption key;

- 5 encryption logic circuitry for implementing a symmetric encryption algorithm using the laser-scribed encryption key and coupled to the blocking gates; and

a zeroizable memory coupled to the encryption logic circuitry,

- 10 wherein sensitive data is encrypted by the encryption logic circuitry using the laser-scribed encryption key and stored as encrypted data in the non-secure memory, and

- 15 wherein the encrypted data is decrypted by the encryption logic circuitry with the laser-scribed encryption key and transferred to the zeroizable memory for use by the host processor.

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19. A method of using secure information utilizing a secure communication device, the secure communication device comprising a host processor, a secure memory coupled to the host processor by a data bus, and a non-secure memory coupled to host processor for storing encrypted data, wherein the secure memory includes a laser-scribed encryption key stored therein, the method comprising the steps of:

- 5        encrypting sensitive data within the secure memory  
10    using the laser-scribed encryption key;  
      storing the encrypted sensitive data in the non-secure memory;  
      decrypting the encrypted sensitive data within the secure memory using the laser-scribed encryption key;  
15    and  
      storing the decrypted sensitive data within the secure memory for use by the host processor.

- 20    20. The method as claimed in claim 19 wherein the secure memory includes blocking gates coupled between encryption logic circuitry and the laser-scribed encryption key, and a zeroizable memory coupled to the encryption logic circuitry, and wherein the storing step comprises storing the decrypted sensitive data  
25    within the zeroizable memory, and wherein the method further comprises the steps of:

- disabling the blocking gates during the encrypting and decrypting steps; and  
      zeroizing the zeroizable memory after the host  
30    processor is through using the decrypted sensitive data stored in the zeroizable memory.

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21. The method as claimed in claim 20 further comprising the step of enabling the blocking gates preventing the encryption logic circuitry from accessing the laser scribed encryption key, the step of
- 5 enabling being performed upon completion of the decrypting step.

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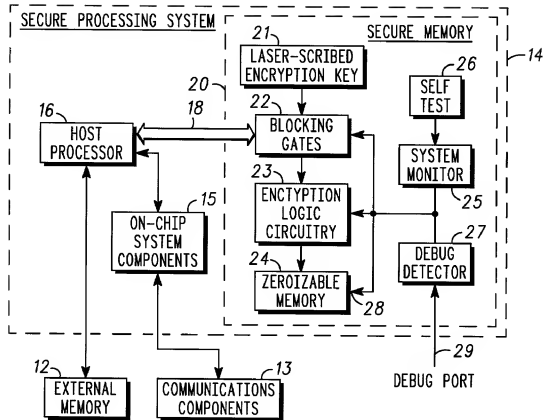
SECURE MEMORY AND PROCESSING SYSTEM HAVING LASER-  
SCRIBED ENCRYPTION KEYAbstract of the Disclosure

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A secure memory and processing system is disclosed for use in various types of communication devices. The secure processing system provides for the encryption and storage of sensitive data in a storage medium

- 10 external to the secure processing system. The encrypted data is decrypted with encryption logic circuitry within the secure memory and transferred to a zeroizable memory for use by a host processor. The secure memory uses a laser-scribed encryption key
- 15 coupled to encryption logic circuitry within the secure memory for encrypting and decrypting the sensitive information.

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**FIG. 1**

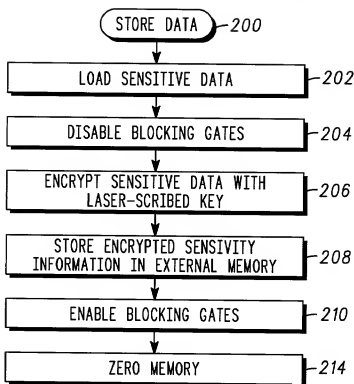


FIG. 2

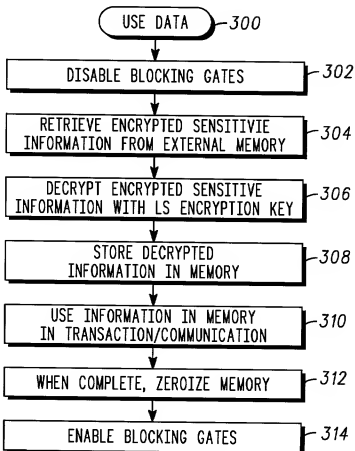


FIG. 3

**COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION**

Attorney Docket GE04592

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below), of the subject matter which is claimed and for which a patent is sought on the invention entitled SECURE MEMORY AND PROCESSING SYSTEM HAVING LASER-SCRIBED ENCRYPTION KEY, the specification of which is attached hereto unless the following box is checked:

- ☐ Application was filed on \_\_\_\_\_  
as Application No. \_\_\_\_\_  
and was amended on \_\_\_\_\_.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application of which priority is claimed.

Prior Foreign Application(s)		Priority Claimed
(Number) _____	(Country) _____	(Day/Month/Year Filed) <input type="checkbox"/> Yes <input type="checkbox"/> No
(Number) _____	(Country) _____	(Day/Month/Year Filed) <input type="checkbox"/> Yes <input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application Number) _____	(Filing Date) _____
(Application Number) _____	(Filing Date) _____

09671949-092700

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below:

(U.S. Parent Application or PCT Parent No.) (Filing Date) (Country)

(U.S. Parent Application or PCT Parent No.) (Filing Date) (Country)

I hereby appoint the attorney(s) and/or agent(s) associated with Customer Number 22863 to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Address all telephone calls to Mr. Frank J. Bogacz at telephone no. (480) 441-4207.

Address all correspondence to Customer Number 22863.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF FIRST INVENTOR: FIRST MIDDLE LAST			INVENTOR'S SIGNATURE	DATE:
Steven R. Tugenberg			<i>Steven R. Tugenberg</i>	9/22/00
RESIDENCE: 10210 North 77 Street, Scottsdale, AZ 85258			CITIZENSHIP: United States	
POST OFFICE ADDRESS: Same as above				

FULL NAME OF SECOND INVENTOR: FIRST MIDDLE LAST			INVENTOR'S SIGNATURE	DATE:
Douglas A. Hardy			<i>Douglas A. Hardy</i>	9-22-00
RESIDENCE: 10705 East Laurel Lane, Scottsdale, AZ 85259			CITIZENSHIP: United States	
POST OFFICE ADDRESS: Same as above				

FULL NAME OF THIRD INVENTOR: FIRST MIDDLE LAST			INVENTOR'S SIGNATURE	DATE:
Thomas E. Tkacik			<i>Thomas E. Tkacik</i>	9/22/00
RESIDENCE: 13406 South 38th Place, Phoenix, AZ 85044			CITIZENSHIP: United States	
POST OFFICE ADDRESS: Same as above				